

into the simpler units of the amorphous state; and, further, that the water molecules of a crystal may by the same agency be broken away from their combination with the salt molecules. Since the publication of the earlier of these observations Prof. Spring has shown that the acid sulphates of the alkali metals may be mechanically decomposed into two portions, one of which contains more acid, and the other more base than the original salt. It is important to recognise that in these three apparently short steps the transition has been made from the overcoming of the simple cohesion of similar molecules in contact with each other to the breaking asunder of the chemical union of dissimilar molecules. At each step the solid molecules appear, not as mere ethereal abstractions, but as substantial portions of matter which can be touched and handled mechanically.

The physical properties of a gas are primarily due to its being an assemblage of rapidly moving molecules. These simpler and more general properties can coexist with, and may be modified by, the more complex relations introduced by chemical affinity as it occurs in compound gases and mixtures.

It appears to me quite legitimate similarly to regard the physical properties of a liquid as due to its being an assemblage of rapidly moving molecules. The liquid system is highly condensed, and the motions of its molecules are controlled by the cohesive as well as by the repulsive forces. The closer approximation of the molecules may reduce their mean free path to an extremely small amount, or it may even cause their translatory motion to disappear, so that the whole kinetic energy of the liquid molecules may be in the form of rotation or vibration.

As we can imagine a perfect gas, so also may we imagine a perfect liquid, the physical properties of which are as simply related to the laws of dynamics as are those of the gas. But the conditions of the liquid state being also those most favourable to the play of chemical affinity, the internal equilibrium of solutions or of mixed liquids must be a resultant of this affinity together with the primary forces of the ideal liquid state.

An ideally perfect solution—that is, a solution the physical properties of which are determined solely by the number of molecules it contains in a given volume—must consist of a solvent and a solute which have no chemical affinity for each other, so that their molecules will neither associate nor dissociate in solution. Probably only comparatively few solutions will be found which even approximate to this ideal perfection. But it appears to me that the study of the problems of the liquid and the dissolved states may be much simplified by the recognition (1) that the primary physical properties of liquids and solutions are due to the fact that they are assemblages of molecules endowed with the amount and the kind of kinetic energy which is proper to their temperature; and (2) that as these primary physical properties of the liquid and dissolved states may be masked and interfered with by chemical affinity, they should be studied as far as possible in examples where the influence of this force is either absent or at a minimum.

NOTES.

WE regret to learn of the death, at the age of seventy-eight, of Dr. T. R. Thalén, professor of physics at the University of Upsala, and one of the most eminent Swedish men of science. The Rumford medal was awarded to him by the Royal Society for his researches on spectrum analysis, and a gold medal was awarded to him by the Swedish Association of Ironmasters in 1874 for his investigations of magnetic iron ore deposits.

A REUTER telegram from Berlin states that the International Conference for the Investigation of Earthquakes met on Tuesday at the Ministry of the Interior, under the presidency of Privy Councillor Dr. Lewald. All the States which possess organised staffs for the investigation of earthquakes were invited by the German Government

to take part in the conference. The conference is expected to last two days.

THE Government Eclipse Expedition in charge of Sir Norman Lockyer, K.C.B., has arrived at Palma, Balearic Islands, where the instruments will be erected for observations of the total solar eclipse on August 30. A Reuter telegram from Madrid reports that the telegraph authorities have decided to frank all telegrams dispatched by members of the various astronomical expeditions regarding observations of the eclipse.

THE London County Council has erected a memorial tablet on No. 14 Hertford Street, Park Lane, where Edward Jenner, the originator of vaccination, resided in 1803; and also on No. 34 Gloucester Square, Hyde Park, where Robert Stephenson, the engineer, resided at one time.

THE death is announced of the Rev. Dr. J. Keith. He was one of the leading educationists of the north of Scotland, and took an active interest in scientific pursuits, especially botany.

THE *Times* correspondent at Wellington, N.Z., states that the Postmaster-General hopes, with the cooperation of Australia, to have wireless telegraphy established across the Tasman Sea within twelve months. The cost will be 28,000*l.*

THE meeting of the tenth International Navigation Congress will be held at Milan from September 24-30. Particulars can be obtained from the secretary, M. Dufourny, 38 Rue de Louvain, Brussels, or from M. Saujast Di Teulada, Villa Real, Milan.

MR. W. E. LANGDON, formerly telegraph superintendent and chief of the electrical department of the Midland Railway, died on Saturday last, August 12. He was for many years a member of the Institution of Electrical Engineers, and was president for the session of 1901-2.

PROFS. RUBERT BOYCE AND RONALD ROSS, of the Liverpool School of Tropical Medicine, left Liverpool on Saturday by the *Campania* for New York. They are proceeding to New Orleans, their services having been offered to the authorities in connection with the outbreak of yellow fever at that port.

A REUTER message from Hong Kong, dated August 12, reports that for nine hours a continuous series of earthquake shocks, two of them prolonged, have been felt at Macao. Slight shocks have been experienced in Hong Kong. An earthquake shock was felt at Chamonix on August 13, at 10.30 a.m. The usual subterranean rumbling noise was heard.

MR. GERALD DUDGEON has been appointed by the Secretary of State for the Colonies to examine and report upon questions relating to the development of the agricultural resources (including cotton) of British West Africa. His title is Superintendent of Agriculture for the British West African Colonies and Protectorates.

THE weather report issued by the Meteorological Office for the week ending August 12 shows that in all the eleven districts into which the British Islands are divided the rainfall since the beginning of the year is below the average, except in the north of Scotland, where the excess is 5.2 inches. The deficiency amounts to 4.6 inches in the north-east of England, and to 3.0 inches in the Midland counties. While at the end of the week in question nearly the whole of England and Ireland were under the influence

of high barometric pressure, an area of low pressure lay over Italy and the Adriatic; these conditions caused an unusually heavy fall of rain over the whole of Switzerland during the night of August 11-12, exceeding 2 inches in amount at several places, with early snowfall at the high-level stations.

In a recent issue (August 5) the *Academy* directs attention to a curious poetical tribute—composed by a French mathematician—to Archimedes, referring to the evaluation of π , which, set out in thirty places of decimals, is 3.141592653589793238462643383279. It will be observed that each of the thirty-one words in this quatrain contains the number of letters corresponding with the successive numbers in the numerical expression:—

3 1 4 1 5 9 2 6 5 3 5
Que j'aime à faire apprendre un nombre utile aux sages
8 9 9
Immortel Archimède, artiste ingénieur!
3 2 3 8 4 6 2 6
Qui de ton jugement peut priser la valeur?
4 3 3 8 3 2 7 9
Pour moi ton problème eut de pareils avantages.

The *Frankfurter Zeitung* reproduces the French verse, and adds a similar effort emanating from a German poet and geometer:—

3 1 4 1 5 9 2 6 5
Dir, o Held, o alter Philosoph, Du Riesen-Genie!
3 5 8 9 7
Wie viele Tausende bewundern Geister,
9 3 2 3 8
himmlisch wie Du und göttlich!—
4 6 2 6
Noch reiner in Aeonen
4 3 3 8
wird das uns strahlen,
3 2 7 9
wie im lichten Morgenrot!

The *Academy* asks for English parallels to these efforts.

THE fifth instalment of the "Fauna of New England" has just been issued in the seventh volume of *Occasional Papers of the Boston (U.S.A.) Society of Natural History*, and comprises a list of the crustacea, by Miss M. J. Rathbun. The number of species recorded is 390.

WE have received a copy of the sixth annual report of the Plymouth Municipal Museum and Art Gallery, in which are recorded the additions made to the collections during the past year, which are numerous. As regards the biological and geological sections, the committee is apparently of opinion that a miscellaneous *omnium gatherum* is preferable to a representative local collection—an opinion not shared by ourselves. In looking over the list of additions to the geological series, we were somewhat surprised to find the entry of a cast as *Archaeopteryx sinensis*, which is, however, evidently a misprint for *A. siemensi*. We also notice molybdenite in place of molybdenite.

THE latest issue (vol. xv., part ii.) of the *Proceedings of the Cotteswold Naturalists' Field Club* contains two papers dealing with local subjects, namely, one by Mr. L. Richardson on the effects of earth-pressure on the Keuper rocks in the neighbourhood of Eldersfield, and a second, by Mr. C. Upton, on some Cotteswold Oolitic brachiopods. In the latter communication the author, after alluding to the extreme difficulty of determining the various forms of *Rhynchonella*, feels himself justified in describing two species of that genus as new, and likewise

two new terebratulæ. Other papers deal with rock specimens from Cyprus, experiences in Korea, and certain early Indian stone monuments.

THE third part of vol. xxv. of *Notes from the Leyden Museum*, issued on April 15, comprises eleven short articles dealing with various invertebrate groups, among which one on Trochidae by Mr. M. M. Schepman, and a second on the collection of chitons in the Leyden Museum by Dr. H. F. Nierstrasz, are illustrated. Among the other contents reference may be made to five by Mr. C. Ritsema on various groups of beetles, and a sixth by Mr. E. Jacobson (communicated by the Rev. E. Wasmann) on the Javan ant *Polyrhachis dives*. It is well known that the oriental ant *Ecophylla smaragdina* has the remarkable habit of employing its larvæ (which have special silk-glands for making their own cocoons) to glue together the edges of leaves for the benefit of the ants themselves, and the Javan species uses its larvæ in the same manner to spin nests.

In the *Records of the Australian Museum* (vol. vi., part i.) Mr. R. Etheridge describes the fore-part of a huge fish from the Lower Cretaceous of Queensland allied to the well known *Portheus* and *Ichthyodectes* of the same epoch. The specimen is provisionally assigned to the former genus, with the designation *I. marathonsensis*, in reference to Marathon, its place of origin on the Flinders River. Later on in the same journal Mr. W. J. Rainbow makes an interesting addition to the subject of social spiders. It appears that some time ago the museum received two huge shawl-like webs taken from the Jenolan Caves, the larger of which measures 12 feet in length and about 4 feet in maximum width. Both webs are closely wrought, and are evidently the work of a large community of a spider referred to new species under the name of *Amaurobius socialis*.

To the May issue of the *Proceedings of the Philadelphia Academy* Mr. B. Smith contributes a suggestive paper on senility in gastropods, mainly based on the study of the Tertiary genus *Volutilithes*. In most extinct gastropods changes of ornamentation may be observed as the earlier are compared to the later whorls; a normal succession of such changes being noticeable, which varies but little in widely sundered groups, although most families display certain distinctive features in this respect. Infancy, youth, and maturity are represented by distinctive styles in the ontogeny of a species, but these stages cannot always, perhaps from the imperfection of the geological record, be correlated with ancestral types. Senile features, of which several usually occur together in the last whorl, do not all necessarily appear at exactly the same time in the ontogeny. Senile species or genera never transmit descendants, being the terminal members of short branches. Evolution among gastropods seems, indeed, to work sometimes rapidly and sometimes slowly, those forms in which it is rapid and bizarre constituting the aforesaid senile offshoots.

REJUVENATION (Verjüngung) forms the subject of an interesting communication by Mr. E. Schultz, of St. Petersburg, to *Biologisches Centralblatt* of July 15. Starting with the fact that in the genital chamber of fasting planarians not only may the whole organ be seen to undergo a retrograde development to its original embryological condition, but the differentiated epithelial cells of this organ may be observed to lose their mutual connection, to become rounded, and to resume their embryological state; the author proceeds to argue that periods

of fasting and torpor, together with the phenomenon of encysting, are of great importance in regard to the rejuvenation of tissue, and consequently to the duration of life of the animal. *Primâ facie*, such periods of rest and rejuvenation would seem to imply longevity in the species in which they occur, and it is therefore suggested that such animals as dormice, badgers, bats, moles, bears, hamsters, and tortoises and many other reptiles are in all probability long-lived. Except in the case of tortoises, our information on this point is, however, very defective. On the other hand, some other explanation must be sought for the longevity which is known to occur in many kinds of birds. The paper concludes with speculations and theories connected with the subject.

IN the July number of the *Psychological Bulletin* (ii., No. 7) Mr. Shepherd Franz describes anomalous time reactions in a case of manic-depressive depression.

THE *Bulletin of the Johns Hopkins Hospital* for July (xvi., No. 172) contains an interesting contribution to the history of medicine in Maryland during the revolution (1775-1779) by Dr. Walter Steiner, various medical articles, proceedings of societies, &c.

THE *Journal of Anatomy and Physiology* for July (xix., part iv.) contains papers by Dr. Gaskell, F.R.S., on the origin of the vertebrates deduced from the study of the ammocoetes, by Dr. Wright on skulls from the round barrows of east Yorkshire, by Dr. Cameron on the development of the retina in Amphibia, and a report by Dr. Bertram Windle on recent teratological literature, together with several articles of anatomical interest.

THE *Journal of Hygiene* for July (v., No. 3) contains papers on canine piroplasmiasis by Drs. Nuttall, Graham Smith, and Wright, and one on bovine piroplasmiasis by Mr. Mettam. Dr. Boycott details an experimental case of skin infection with ankylostoma, and Mr. MacConkey contributes an important paper on lactose-fermenting bacteria in fæces, Colonel Leishman, Captain Harrison, and Lieuts. Smallman and Tulloch describe very fully an investigation upon the blood changes following anti-typhoid inoculation; this and several other interesting papers complete the contents of an excellent number.

IN a report on the metropolitan water supply, Dr. Scott Tebb, the public analyst for Southwark, points out that five out of the seven committees of inquiry which have investigated the quality of the Thames water have condemned the river as a source of domestic supply to the metropolis, that the quality of the water as indicated by analysis has shown no substantial improvement during the last thirty years, that the river is extensively polluted, and that it is doubtful if this can ever be prevented. He therefore recommends that London should as soon as possible abandon the Thames as a source of domestic supply, a conclusion neither new nor novel. But when in the body of the report it is stated that "we know nothing of the essential cause of either typhoid fever or cholera, and the medical profession is as much in the dark now as it was 40 years ago" (respecting these diseases), it becomes doubtful how much weight should be attached to Dr. Tebb's conclusions. A large portion of the report is filled with abstracts from papers and books, mostly old, attempting to show that the cholera vibrio and typhoid bacillus have nothing to do with the respective diseases, the overwhelming evidence on the other side being completely suppressed.

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A NUMBER of new plants or new localities for previously recorded Indian plants are given in Nos. 4 and 5 of vol. lxxiii., part ii., of the *Journal of the Society of Bengal*. Dr. Prain records several new species from Sikkim, including a *Geum* and a *Potentilla*, which are figured, five new species from Burma, and two new orchids from Chota Nagpur. Also Dr. Prain and Mr. Burkill have a note on a new yam, not, however, fit for food, which was collected abundantly in Burma. In another note Mr. J. R. Drummond describes a new *Scirpus* from Baluchistan, with some allied species.

It is characteristic of the Americans that when they took over the Philippines they accepted also the responsibilities thereby entailed. In 1837 Father Blanco published a "Flora de Filipinas," enumerating more than a thousand species and varieties; the descriptions were in many cases imperfect, Blanco's knowledge of the plants of neighbouring countries was slight, and unfortunately his herbarium has been lost, so that except where types have been preserved in European herbaria, identification has been most difficult. Mr. E. D. Merrill has prepared a review of the three editions and appendix, of the flora to summarise present knowledge and to provide a basis for further identification by collectors; the volume forms No. 27 of the Publications of the Bureau of Government Laboratories, Manila.

IN the Botanic Gardens at Brussels special facilities have been provided for students for many years in the matter of plant collections, notably of economic, also of official and poisonous plants. More recently, in 1902, it was decided to lay out four groups of plants which should be geographical, systematic, evolutionary (phylogénique), and physiological (éthologique), in addition to a group of xerophytes. Copies of the pamphlets explaining the arrangements and the nature of the collections, which are supplied to students, have been received. The evolutionary collection is designed to illustrate variability, heredity, and the origin of new varieties and species. The plants that constitute the "collection éthologique" have been selected on account of their showing special developments, whether for nutrition, reproduction, or some other purpose. A house has been devoted to xerophytes ever since Demoulin's collection was presented in 1882; this has been extended, and a novel feature of the present system is the arrangement of a number of species of cactus as a practical exhibition of an evolutionary series.

MONEY-BOXES in the form of mammæ are made in Germany and Italy, and these form the subject of a paper by F. Rosen in *Globus* (lxxxvii. p. 277). In olden times the mamma was the symbol of abundance, blessings and wealth, therefore this form is peculiarly appropriate for money-boxes; but money-boxes are not ancient. In prehistoric times vessels were frequently made in the form of mammæ, and they are still so made by the folk. The author refers to the pomegranate as an ancient symbol of riches and good fortune; one half of it has some resemblance to a mamma, and the numerous seeds it contains suggest fertility. The mamma was certainly a luck-symbol, and Astarte, Aphrodite, and Isis were luck-goddesses. Astarte, Venus, and Isis were protective patronesses of sailors. He refers to the fact that one often finds money-boxes in the form of pigs; the "lucky pig" is an extremely common talisman in Germany. Pregnant sows were offered to Demeter or Ceres because of the great fertility of this animal. Leland ("Etruscan Roman Remains," p. 255) says, "Ceres was pre-eminently a

goddess of fertility, therefore of good luck and all genial influences; hence little gold and silver pigs were offered to her, and also worn by Roman ladies, partly to ensure pregnancy, and partly for luck."

THE recent issues of the *Monthly Weather Review* of the U.S. Weather Bureau contain, *inter alia*, some important articles by Prof. Bigelow on the application of mathematics to meteorology, on the diurnal periods in the lower strata of the atmosphere, and on the observations with kites at the Blue Hill Observatory, from 1897-1902. In the first-named paper, the author points out that no branch of modern science has suffered more severely than meteorology by the misapplication of good mathematics to good observational data, and that the results of recent balloon and kite observations show that nearly the entire range of general theory of the circulation of the atmosphere must be pronounced a misfit. We think we are safe in saying that no other meteorological journal can compare with the *Monthly Weather Review* in its endeavour to popularise meteorological science, by the publication of original articles, reprints, and translations from foreign papers. The ordinary meteorological tables are based on data from about 3583 stations, some of which belong to countries outside the United States. Since December, 1904, the Weather Bureau has received a large number of reports giving simultaneous observations over the Atlantic and Pacific Oceans made at Greenwich—noon. These are charted, and, with corresponding land observations, will form the framework for daily weather charts of the globe. As a further instance of disseminating useful information, we may refer to an article on forecasting the weather and storms, by Prof. W. L. Moore, in the *National Geographic Magazine* for June, illustrated by a number of weather charts. The author points out, with justice, that to anyone who will read the text, and carefully follow the charts which illustrate and make it clear, the daily weather chart will be an object of interest as well as of pleasure and profit. Every step taken, from the receipt of the observations to the publication of the weather chart and preparation of forecasts, is explained with clearness and precision.

SEVERAL simple forms of instruments affording a rapid and accurate means of determining the paths of refracted and reflected rays through any optical system are described by Mr. J. R. Milne in the *Proceedings of the Royal Society of Edinburgh* (vol. xxv., p. 806).

It is well known that the minimum potential of a point discharge is increased by the discharge, a blunting or powdering of the point occurring. That the blunting is, however, not responsible for the rise in potential appears evident from a series of experiments made by Mr. F. R. Gorton and described in the *Verhandlungen* of the German Physical Society (vol. vii., p. 217), where it is shown that under the influence of either an ultra-violet radiation or the radiation of radium the blunted point recovers its original value for the minimum potential. The blunting of the point is thus a minor factor in the question, and the conditions are investigated in which constant, reproducible values can be obtained so that the subject may be more fully investigated.

In the July number of the *American Journal of Science* Mr. D. Albert Kreider describes a special form of voltmeter in which the accuracy and sharpness of the volumetric method of estimating iodine by means of sodium thiosulphate are utilised. A special form of potassium iodide cell is adopted in which iodine is liberated by the

action of the current; its amount is then readily ascertained by direct titration. The results obtained agree very closely among themselves if a certain current be not exceeded, the difference then not exceeding 1 part in 10,000; but the results are uniformly higher by 0.06 per cent. to 0.09 per cent. than are shown by a silver voltmeter placed in the circuit. The rapidity and simplicity of the method should adapt it for practical application.

PROF. BALBIANO, writing in the *Atti dei Lincei*, xiv., 12, gives an account (read June 18) of the work of Prof. Augusto Piccini, whose death occurred on April 16. While Piccini's most important researches were connected with the periodic law of Mendeléeff, attention is directed to a little-known article on oxygenated water written by him two years ago for the "Encyclopædia of Chemistry," in which the theory was advanced that the atoms of oxygen which it contains are in the form of a combination inferior to that of water.

AN interesting application of the mathematical theory of elasticity is given by Prof. Vito Volterra in the *Atti dei Lincei*, xiv., 12. The problem is that of an elastic ring or hollow cylinder of rectangular radial section from which a slice is removed and the separated parts joined together, and the two cases are considered where the fissure is radial and where the portion removed is of uniform thickness. From calculation, the author found expressions representing increase of internal length, decrease of external length, and distortion of the lateral surface of the cylinder into a form concave outwards, and experiments conducted with actual cylinders of caoutchouc closely reproduced all the results of calculation.

DR. ROBERTO BONOLA, of Pavia, discusses in the Lombardy *Rendiconti*, xxxviii., 11, the theorems of Padre Gerolamo Saccheri on the sum of the angles of a triangle, in connection with Dehn's researches, Euclid's axiom of parallels, and the postulate of Archimedes. Saccheri's investigations were published at Milan in 1793 under the title "Euclides ab omni naevo vindicatus," and were based on the consideration of "bi-rectangular isosceles quadrilaterals," this term being used to designate a quadrilateral ABCD having $AB=CD$, and

$$\text{angle } ABC = \text{angle } BCD = 90^\circ.$$

In ordinary space such a quadrilateral is a rectangle. Padre Saccheri gives a proof that if one bi-rectangular isosceles triangle has its remaining angles acute, right, or obtuse, the same property will be true of every other such quadrilateral. From this he deduces that if one triangle has the sum of its angles greater to, equal to, or less than two right angles, the same will be true of every other triangle, *i.e.* the property commonly known as Legendre's theorem on the angles of a triangle. Dr. Bonola refers to Dehn's work in proving that Legendre's theorem is independent of the postulate of Archimedes, and he gives corresponding proofs in connection with Saccheri's work.

A SIXTH edition of Mr. A. B. Lee's "Microtometist's Vade-mecum: a Handbook of the Methods of Microscopic Anatomy," has been published by Messrs. J. and A. Churchill. The first edition of the work appeared in March, 1885, and was reviewed in our issue of June 18 of the same year (vol. xxxii. p. 147). Many of the suggestions made on that occasion have since been adopted. The text of the book has been even more condensed than in the last edition, and this plan has given room for much new matter. The chapter on staining with coal-tar colours

has been removed, this subject being now dealt with in the general chapter on staining, which has been re-written. The chapters on connective tissues, on blood and glands, and on the nervous system have been thoroughly revised and considerably amplified. Explanations relating to the principles of technical processes have been included in general chapters, and do not in this edition occur under the special sections.

OUR ASTRONOMICAL COLUMN.

THE PLANET MARS.—In No. 360 of the *Observatory* Mr. Wesley discusses the photographs of the planet Mars which Mr. Lowell recently published. Mr. Wesley has made a very careful study of the six prints, and has been able to distinguish easily, on one or another of them, the features named by Mr. Lowell. He is not, however, prepared to corroborate the opinion expressed by the latter that the photographs confirm the fact that the so-called "canals" are *continuous lines*, for imperfect definition might render a row of dots as an unbroken line. As the Lowell photographs are too small to reproduce satisfactorily, Mr. Wesley has made a composite drawing showing all the features seen on any of the prints, and this is given as a frontispiece.

In the same journal Mr. Denning gives, among other planetary observations, an account of his recent areographical researches with a 12½-inch Calver reflector, using a power of 300. He is very certain of the actual existence of the features termed "canals," many of which he was able to identify quite easily. He regards "canals," however, as an unfortunate designation for the irregular, frequently knotted streams of shading, which are by no means straight or narrow, but have a perfectly natural appearance, and says:—"The idea that they are clearly cut lines, suggestive of artificial origin, may be dismissed as a mere conjecture unsupported by reliable evidence."

Major Molesworth, of Trincomalee, Ceylon, has recently communicated to the Royal Astronomical Society a record of his observations of Mars during the opposition of 1903. These observations were made, under excellent conditions, with a 12½-inch Calver reflector, generally employing a power of about 450. An abstract of this paper, giving the principal tables and conclusions, appears in No. 8, vol. lxxv., of the *Monthly Notices*, accompanied by six beautiful drawings showing the chief characteristic features of the Martian surface during the opposition. As his results testify, Major Molesworth has made a long and laborious study of this planet with great zeal, and he has not the slightest doubt as to the reality of the "so-called canals." These markings do not, however, appear to him as continuous definite lines, but rather like "streaky" lines such as would be drawn on very rough paper with a rounded crayon or stump. He records several instances of gemination, and offers a natural explanation of the phenomenon. On six occasions he observed projections either on the limb or the terminator. In conclusion, he proposes a new classification of Martian features, and discusses the several "contrast" and "illusion" theories which have been opposed to the reality of the "canals." Likening these peculiar markings to those seen on Jupiter, he concludes that if the latter be accepted as real—as they undoubtedly are—then the similar ones on Mars cannot, on any logical basis, be ascribed to illusion.

THE RINGS OF SATURN.—Observing at Aosta (Italy) during the later months of 1904, MM. Amann and Rozet noted a novel feature on Saturn's rings. On October 20 M. Amann saw a sharp, accentuated marking, or shadow, on the rings some distance from the outer edge of the shadow cast by the planet itself, and having a curved form concave towards the planet. Between October 20 and November 15 this new feature was not seen, although numerous observations were made under favourable conditions. After November 15 the shadow was seen repeatedly, and it was then noticed that that part of it which was projected on the inner ring was always broader and more accentuated than the other part. Between December 22 and 27 it was seen that this broader portion was bifurcated, so that the whole shadow had the form of a

capital Y; that the apparition was a shadow was shown by its fixed position relative to the planet, notwithstanding the rotation of the latter and its rings (*Bulletin de la Société astronomique de France*, August).

DECLINATIONS OF CERTAIN NORTH POLAR STARS.—In No. 3440 of the *Astronomische Nachrichten* Dr. Auwers pointed out that in certain hours of right ascension, north of declination +82°, there were gaps containing no "fundamental" stars, and asked that these gaps might be filled. In answer to this request Miss Harriet Bigelow, of the Smith College Observatory (University of Michigan), has determined the places of twenty-one stars situated between declinations +84° 34' and +88° 55', and now publishes them in vol. vii. of the *Proceedings of the Washington Academy of Sciences* (pp. 189-249). The instrument employed was the Walker meridian circle, having a telescope of 6.3 inches aperture and a focal length of 8 feet.

THE MINOR PLANET OCLLO (475).—Another set of positions of the interesting asteroid Ocllo, as determined by Mr. R. H. Frost at Arequipa, are given in Circular No. 103 of the Harvard College Observatory. The object was re-discovered on, and its position determined from, a plate taken on June 6, and was also shown on other plates secured on June 7 and 9. The determined positions show that Ocllo seems to be about 4° from its position as computed from the previously published elements. The data now given, together with the positions published in Circulars Nos. 63 and 101, should enable the elements of Ocllo's peculiar orbit to be determined with great accuracy, and to insure against the future loss of this planet.

THE ROYAL UNIVERSITY OBSERVATORY OF VIENNA.—We have just received vols. xv. and xviii. of the *Annalen der k.k. Universitäts-Sternwarte in Wien*, edited by the director, Prof. E. Weiss. Vol. xv. contains a catalogue of 2417 stars the places of which have been determined by Herr F. Bidschof with the meridian circle, and are given for the mean equinox of 1885.0. The instrumental equipment and the methods employed in the reduction are discussed at length. A series of observations of Jupiter made between February 20 and May 1, 1898, by Herr J. Rheden is also described in this volume, and the description illustrated by fifty coloured drawings of the planet, which are given on the two accompanying plates.

Vol. xviii., in the first part, is devoted to the results obtained from the observations of minor planets and comets, made by Dr. J. Palisa with the Grubb refractor of 67 cm. (about 27 inches) aperture during the years 1899-1901. The observations of seven comets and four nebulae are included, and the whole of the results are tabulated at the end in a handy form for reference. This volume is completed by the meteorological results obtained in 1901, 1902, and 1903, the pressure, temperature, &c., being given for 7 a.m., 2 p.m., and 9 p.m. on each day.

THE STATE AND THE CLAYWORKER.¹

IT is the purpose of each of these works to supply the members of the clay industry, in the State to which it refers, with an account of the geological relationships, the mode and place of occurrence, and the chemical and physical properties of the raw clays both worked and unworked. The manufacturing processes of various types of ware are also described as they are practised in the State, with numerous details of physical tests that have been applied to them.

The subject has been treated upon very similar lines in both reports; the Iowa volume, however, contains more information upon the practical manufacturing side; it devotes a chapter to the selection and upkeep of power plants, and has a fuller account of different forms of kiln; there is even a section dealing with the composition of the fuels used in burning the clays. But this volume

¹ "Clays and Clay Industries of Iowa." By S. W. Beyer, G. W. Bissell, I. A. Williams, J. B. Weems, and A. Marston. Iowa Geological Survey, vol. xiv. Pp. xi+664. (Des Moines: Iowa Geol. Survey, 1904.)

"The Clays and Clay Industry of New Jersey." By H. Ries and H. B. Kümmel, assisted by G. N. Knapp. Geological Survey of New Jersey, vol. vi. Final Report. (Trenton, N.J.: Geological Survey of New Jersey, 1904.)